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Out-Patient Management of Mild or Uncomplicated Diverticulitis: A Systematic Review

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Key Words
Out-patient · Ambulatory · Uncomplicated diverticulitis · Mild diverticulitis

Abstract
Background: Management of diverticular disease has undergone a paradigm shift, with movement towards a less invasive management strategy. In keeping with this, outpatient management of uncomplicated diverticulitis (UD) has been advocated in several studies, but concerns still remain regarding the safety of this practice. ***Aim:*** To assess outcomes of out-patient management of acute UD. ***Methods:*** A comprehensive search for published studies using the search terms 'uncomplicated diverticulitis', 'mild diverticulitis' and 'out-patient' was performed. The primary outcomes were failure of medical treatment. Secondary outcomes were recurrence rate at follow up and medical cost savings. ***Results:*** The search yielded 192 publications. Of these, 10 studies met the inclusion criteria including 1 randomized controlled trial, 6 clinical controlled trials and 3 case series. There was no difference in failure rates of medical treatment (6.5 vs. 4.6%, p = 0.32) or in recurrence rates (13.0 vs. 12.1%, p = 0.81) between those receiving ambulatory care and in-patient care for UD. Ambulatory treatment is associated with an estimated daily cost savings of between 600 and 1,900 euros per patient treated. Meta-analysis of data was not possible due to heterogeneity in study designs and inclusion criteria. ***Conclusion:*** Ambulatory management of acute UD is reasonable in selected patients.

Introduction

Diverticular disease is reported as one of the 5 gastrointestinal diseases most burdensome to a healthcare system [1]. Eighty five percent of patients with acute diverticular disease admitted in the emergency department have uncomplicated diverticulitis (UD) and are treated conservatively with medical treatment [2]. Despite this, a majority of these patients are treated as in-patients with a subsequent burden on the healthcare system [3]. The reasons for admission are multifactorial, including difficulty in establishing a diagnosis, fear of missing alternative pathology or established local guidelines advocating management with intravenous (IV) antibiotics.

Acute diverticulitis can be broadly classified as UD or complicated diverticulitis (CD) based on clinical, laboratory and radiological findings.

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The burden of healthcare costs due to diverticular disease has increased steadily over the years. The estimated total cost for treating diverticulitis accounts up to 5.3% of the total annual healthcare budget in the United Kingdom [4]. Therefore, ambulatory treatment of UD has the potential to result in considerable changes in resource utilization.

Studies have shown that a majority of patients with UD follow a benign course. For example, Buchs et al. [5] have demonstrated a 1.4% recurrence rate in a 5-year follow up, and progression to CD is relatively rare. The treatment of UD has evolved dramatically since the initial report by the American Society of Colon and Rectal Surgeon on the practice parameters in treatment of IV antibiotics, fluid and bowel rest [6]. Recent literature confirms that oral antibiotics are equally efficient to in-patient IV antibiotics therapy for UD, with studies showing that time to recovery and risk of further attacks was not influenced by the method of antibiotic delivery [7, 8]. Currently, there is a shift in interest towards UD being managed without any antibiotics [7, 9].

There is no recent systematic review that has compared ambulatory treatment with the traditional in-patient treatment of UD. This systematic review aimed at examining the ambulatory treatment method of diverticulitis in an out-patient setting and assessing outcomes of ambulatory versus hospital care.

Methods

The systematic review was conducted according to the Meta-Analysis of Observational Studies in Epidemiology reporting guidelines for systematic reviews of observational studies [10]. Inclusion criteria were as follows: studies (randomized and non-randomized studies) that evaluated the outcomes of ambulatory treatment in patients with CT confirmed UD with antibiotics were eligible. Studies that involved right-sided diverticulitis and where management of UD was not in an out-patient setting were excluded.

Key Definition

Ambulatory treatment of UD was defined as patients that had an in-patient hospital stay of not longer than 24 h, before being discharged to continue treatment at home in an out-patient setting. Treatment may have included first dose or IV antibiotics in hospital, but not more than 24 h as an in-patient. Treatment at home included oral antibiotics with instructions on diet and analgesia, or 'hospital-at-home' setting with daily nurse visits where IV antibiotics were administered and patients were followed up with regular doctor visits.

Search Strategy

The following databases were searched up to March 2015: Medline, Embase, Scopus and Cochrane library from 1945 to December 2015. The following search terms were used: 'uncomplicated diverticulitis' (all fields) or 'mild diverticulitis' (all fields) and 'out-patient' (all fields). A separate search was used for the Cochrane library that included search terms 'diverticulitis' (title, abstract or keyword) and 'out-patient' (title, abstract or keyword). Additionally, a hand search was performed of relevant studies. The search was not restricted by language. Articles published in languages other than English were translated using Google translate™, a browser in-built online translation facility.

Study Selection

Two independent reviewers (CF and IB) performed the search using the agreed-upon search strategy. Following a screen of articles by title, relevant abstracts were reviewed and assessed to determine if they required full article retrieval to further assess if they were eligible for inclusion in the study. Selected papers were reviewed in full and data extracted from them. Any disagreements in the outcome of study selection were resolved by discussion between the 2 reviewers.

Data Extraction

The 2 independent reviewers (CF and IB) used a standardized format to extract data from studies including title, author, publication year and country of origin. Individual elements of selected studies were extracted including study details, allocation methods, treatment characteristics, follow-up periods and outcomes were extracted. The outcomes assessed were defined as primary and secondary outcomes. Primary outcomes include failure rate of medical therapy at immediate follow-up. Secondary outcomes assessed include recurrence rate at a period of longer follow-up and medical cost savings. The description of outcomes 'failure of medical treatment' and 'recurrence rate' are as listed below:

'Failure of medical treatment' is measured as number of patients requiring escalated therapy during immediate follow-up following initial admission. Escalated therapy includes extended antibiotic treatment, radiological drainage or surgery.

'Recurrence rate' is measured as number of patients who present with recurrent attack of diverticulitis during a period of longer follow-up, after successful treatment at initial admission. A recurrent attack of diverticulitis is either clinical symptoms similar to initial presentation and/or radiological evidence of acute diverticulitis.

Quality Assessment

The Cochrane Effective Practice and Organization of Care Risk of Bias Tool was used to assess the risk of bias in randomized controlled trials (RCTs), non-RCTs, controlled clinical trial (CT) and case series [11].

Results

Study Characteristics

A total of 192 articles were retrieved relating to the treatment of acute, mild or uncomplicated UD in an ambulatory setting (fig. 1). After the exclusion of duplicates, 90 records underwent screening for inclusion based on their abstracts and titles. Out of these, 40 studies were deemed relevant and full articles were assessed for eligibility. Thirty studies were excluded for reasons as listed

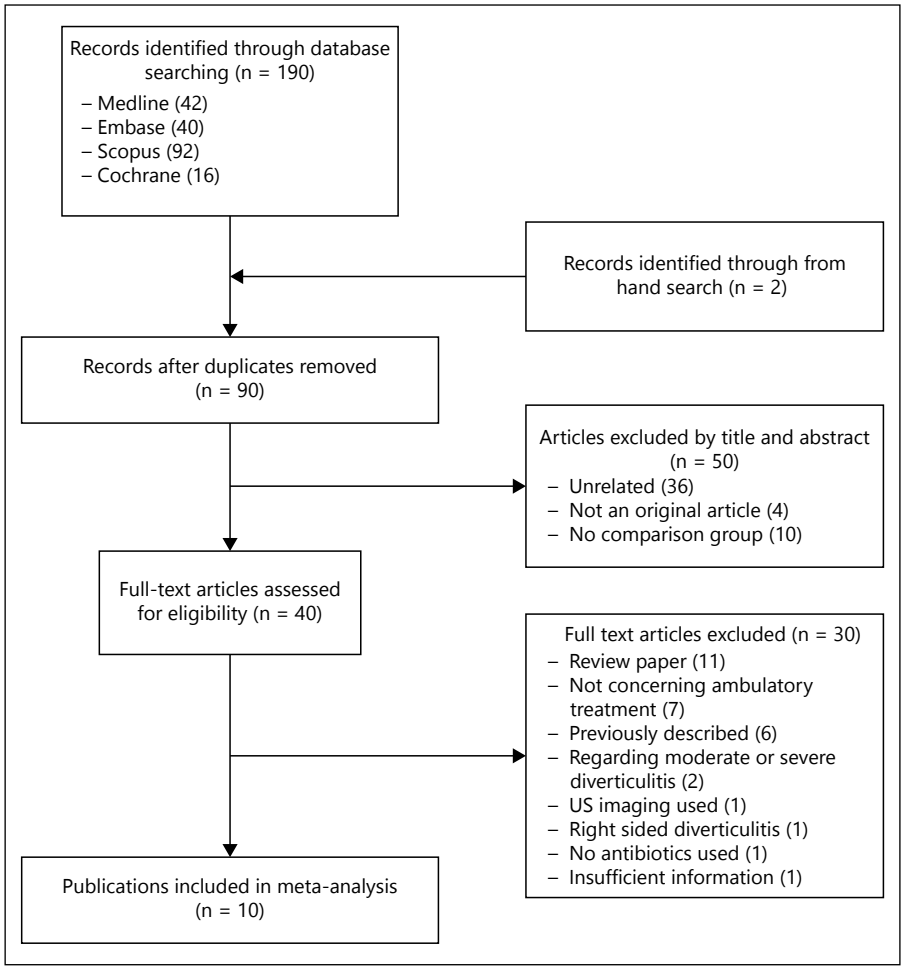

Fig. 1. Flow diagram of study selection.

(fig. 1). A total of 10 studies met the inclusion criteria for narrative synthesis [1, 12–20]. There was a high risk of selection, performance and detection bias in all studies except one [1] (fig. 2).

The characteristics of all the 10 included studies are presented in table 1. One of the 10 studies was an RCT [1], with the remaining 9 studies having non-randomized designs [12–20]. Nine studies were carried out as single-centre studies [12–20], while only the RCT was a multicentre study [1]. Seven studies including the RCT reported on outcomes of ambulatory antibiotic treatment in UD in comparison to an in-patient cohort [1, 12, 13, 17–20]. The remaining 3 studies reported on ambulatory treatment alone in case series of patients with no in-patient group for comparison [14–16]. All studies used CT imaging to confirm acute UD in their patients. They also did not exclude patients based on the location of diverticulitis in bowel. The combined study period in the included studies was from 2006 to 2014 [1, 12–20].

All studies reported on failure rate of medical treatment that was recorded as either readmission rates to hospital for IV antibiotics with or without other interventions or as a longer course of oral antibiotics during a period of immediate follow-up. Only 5 studies reported the recurrence of diverticulitis as requiring further treatment with or without hospitalization during a period of longer follow-up [15, 17, 19–21]. The period of follow-up in which recurrence was noted was highly variable ranging between 1 and 24 months. Cost savings from ambulatory treatment were recorded in 5 of the included studies [1, 12, 14, 19, 20].

In summary, only 2 studies reported on both the primary outcomes of failure rate of medical treatment and secondary outcomes of recurrence rate and medical cost savings [19, 20]. Biondo et al. [1] was the only study that assessed the benefits in quality of life in patients that recovered at their own home residence. The wide variation in study time period, type of outcomes recorded and du-

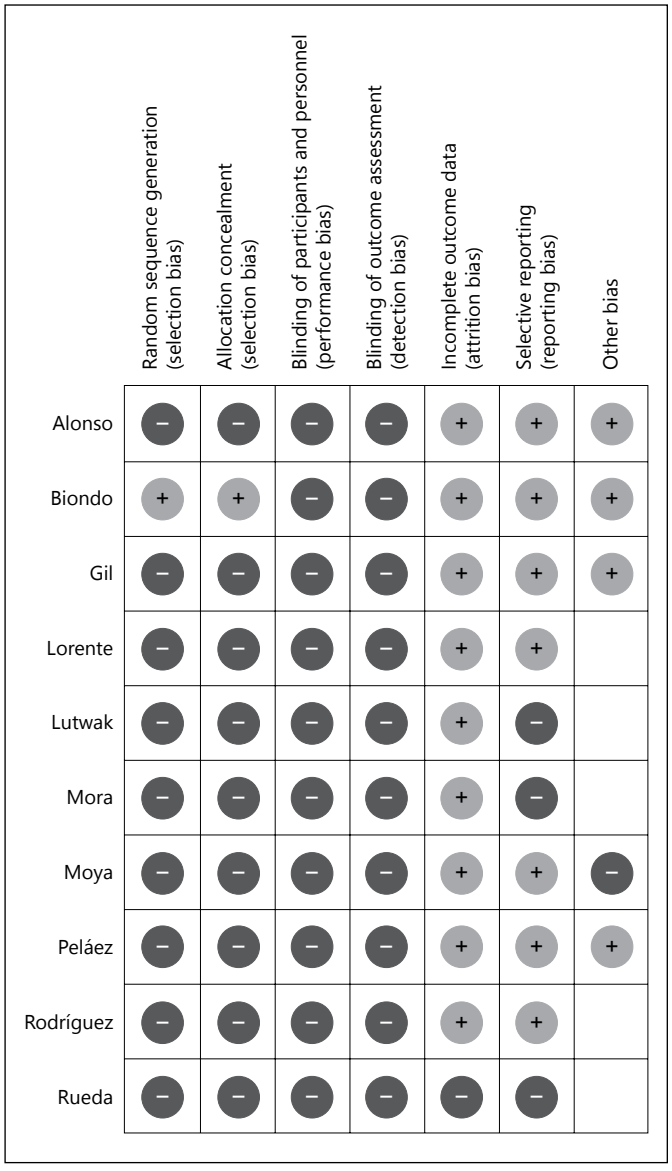

Fig. 2. Author evaluation of the various sources of potential bias in all included studies with reference to Cochrane Collaboration Guidance. Dark grey specified high risk of bias, grey specifies low risk of bias.

ration of follow-up make direct comparison of studies difficult.

Patient Characteristics

There were an estimated total of 772 patients. Five hundred thirty-three patients were selected for ambulatory treatment and the remaining 219 patients were included in the in-patient treatment group. Of note, only 132 patients were enrolled into an RCT to compare the effectiveness of ambulatory treatment in comparison to in-patient treatment of UD [1].

All studies reported on patients admitted with the first presentation of acute UD that was confirmed with CT imaging. Only 3 studies used modified Hinchey Classification to stage patients [1, 13, 14]. Only Mora Lopez et al. [16] used modified Neff classification to select patients with UD. All other studies did not specify the grading classification used but listed features of CT findings that were related to UD [12, 17–20, 22].

The patient characteristics of the 10 included studies are presented in table 2. The studies varied in reporting age and gender in their population cohorts. Five studies reported the overall mean age for patients from both ambulatory and in-patient treatment groups [1, 12, 17, 18, 20]. Lutwak and Dill [18] did not provide any information regarding the mean age in either treatment groups. Rodríguez-Cerrillo et al. [12] and Mora Lopez et al. [16] did not provide gender data of patients enrolled in their study.

Type and Duration of Antibiotics

The choice and duration of antibiotics in patients across the 10 studies are shown in table 3. Two studies did not specify the type and length of antibiotic usage: Alonso et al. [17] did not specify this for the in-patient setting and Lutwak and Dill [18] did not specify for either patient settings.

The type and duration of antibiotics varied. The most common antibiotic regimen used, as seen in 5 studies, was oral amoxicillin or a combination of oral ciprofloxacin and metronidazole in patients who were allergic to penicillin [1, 14, 16–18]. Both studies that treated patients in 'hospital-at-home' setting used IV Ertapenem once daily, similar to the antibiotic cover also received by their in-patient cohort [12, 13].

The length of oral antibiotics in the ambulatory setting was between 4 and 10 days. Patients treated in hospital were typically given 7–10 days of IV antibiotic therapy; however, for those discharged earlier than this, a short period of oral antibiotics was prescribed [1, 19, 20].

Primary Outcome

Failure of Medical Treatment

All studies reported on the number of patients who failed medical therapy in the ambulatory management group and also in the in-patient group where it was applicable (table 4). For escalation therapy, this was specified as to have occurred between 7 and 60 days in studies included after initial medical therapy was commenced [1, 12–20].

Table 1. Characteristic of included studies

Study ID	Study design	Population setting	Intervention	Comparison	Primary outcomes	Secondary outcomes
Reporting on outcomes of ambulatory treatment with oral antibiotics in comparison to standard in-patient therapy:						
Biondo et al. [1], 2014, Spain	RCT	n = 132 Multi-centre study involving 5 tertiary hospitals	Ambulatory (n = 66) 10 days PO Abx	In-patient (n = 66) IV Abx and home on PO Abx	(1) Failure rate of medical Tx (2) Mortality during first 60 days	(1) Quality of life assessment with SF-12 questionnaire on day 14–60 (2) Medical cost savings
Lorente et al. [19], 2013, Spain	CCT Retro	n = 134 Methods for allocation to in-patient Tx not reported	Ambulatory (n = 90) PO Abx for 7 days	In-patient (n = 46)	Failure rate of medical Tx	(1) Recurrence rate at follow-up (2) Medical cost savings
Moya et al. [20], 2012, Spain	CCT Prosp	n = 76 Allocation based on date of presentation	Ambulatory (n = 32) PO Abx for 10 days	In-patient (n = 44) IV Abx for 5 days and PO Abx for 7 days	Failure rate of medical Tx	(1) Recurrence at follow-up (2) Medical cost savings
Alonso et al. [17], 2010, Spain	CT Prosp	n = 96 Allocation to in-patient Tx based on inability to tolerate oral diet, comorbidities and availability of family support	Ambulatory Tx (n = 70) 7 days PO Abx	In-patient Tx (n = 26) IV Abx	Failure rate of medical Tx	Recurrence rate at follow-up
Lutwak and Dill [18], 2012, USA	CCT	n = 42 Allocation to in-patient Tx based on inability to tolerate oral diet, comorbidities and availability of family support	Ambulatory Tx (n = 21) PO Abx	In-patient Tx (n = 21) IV Abx	Failure rate of medical Tx	
Reporting on outcomes of ambulatory treatment at hospital at home in comparison to standard in-patient therapy:						
Rodríguez-Cerrillo et al. [12], 2013, Spain	Prosp Cohort	n = 52 Allocation to in-patient Tx based on if allergic to B-lactam or other co-morbidities	Hospital-at-home (n = 34) IV Abx	In-patient Tx (n = 18) IV Abx	Failure rate of medical Tx requiring further Tx	Medical cost savings
Rueda et al. [13], 2012, Spain	Retro Cohort	n = 56 Allocation to in-patient Tx based on age >80, comorbidities, availability of family support and patient's preference	Hospital-at-home (n = 38) IV then to PO Abx for Tx period of 10 days	In-patient Tx (n = 18) IV then PO Abx for Tx period of 10 days	Failure rate of medical Tx requiring further Tx	
Reporting on outcomes of ambulatory treatment with oral antibiotics only:						
Peláez et al. [15], 2006, Spain	Prosp Case series	n = 40 Patients that tolerate oral diet, nil co-morbidities and availability of family support selected	Ambulatory Tx (1) 7 days PO Abx (2) Clear liquid first 2 days	–	Failure rate of medical Tx	Recurrence rate at follow-up
Martín Gil et al. [14], 2009, Spain	Prosp Case series	n = 74 Patients clinically stable and not immunocompromised or on oral corticosteroids	Ambulatory Tx (1) 7–10 days PO Abx (2) Liquid diet for first 3 days	–	Failure rate of medical Tx	Medical cost savings
Mora Lopez et al. [16], 2013, Spain	Prosp Case series	n = 68 Patients with nil co-morbidities or nil criteria of SIRS selected	Ambulatory Tx 10 days PO Abx	–	Failure rate of medical Tx	

CCT = Controlled CT; Prosp = prospective; Retro = retrospective; Tx = treatment; Abx = antibiotics; PO = oral.

Table 2. Patient characteristics of included studies

First author, year	Age, years, mean			Sex, male, %			Sex, female, %		
	n	OP	IP	n	OP	IP	n	OP	IP
Biondo, 2014	56.3	55.9	56.8	54.5	51.5	57.6	45.5	48.5	42.4
Lorente, 2013	–	58.75±15	60.52±19	44.1	44.4	43.5	55.9	55.5	56.5
Mora Lopex, 2013	–	59	–	–	–	–	–	–	–
Rodríguez-Cerrillo, 2013	78	77	79	17	17.6	15.8	83	82.4	84.2
Rueda, 2012	–	61.33	63.97	44.6	47.4	38.9	55.4	52.6	61.1
Moya, 2012	57.9	56.06	59.65	47.4	50	45.5	52.6	50	45.5
Lutwak, 2012	62	–	–	–	–	–	–	–	
Alonso, 2010	63	57	69	52.1	54.3	46.2	47.9	45.7	53.8
Martín Gil, 2009	–	55	–	–	59.5	–	–	40.5	–
Paláez, 2006	–	56.9	–	–	50	–	–	50	–

n = Total number; OP = out-patient; IP = in-patient.

Table 3. Choice of antibiotics in included studies

Study ID	Choice of Abx	
	ambulatory	inpatient
Biondo et al. [1], 2014	10 days PO Amoxicillin 1 g TDS OR *Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	3–4 days IV Amoxicillin 1.2 g TDS OR *Ciprofloxacin 200 mg BD and Flagyl 500 mg TDS then PO Abx
Lorente et al. [19], 2013	7 days PO Amoxicillin 1 g TDS OR *Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	Cefotaximine 1 g QDS + Flagyl 500 mg TDS then PO Abx
Mora Lopez et al. [16], 2013	10 days PO Amoxicillin 1 g TDS OR *Ciprofloxacin 500 mg BD + Flagyl BD	None
Rodríguez-Cerrillo et al. [12], 2013	1 g IV Ertapenam OD	1 g IV Ertapenam OD
Rueda et al. [13], 2012	1 g IV Ertapenam OD	1 g IV Ertapenam OD
Moya et al. [20], 2012	10 days PO Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	5 days IV Ciprofloxacin 400 mg BD + Flagyl 500 mg TDS then PO Abx
Lutwak and Dill [18], 2012	Not specified	Not specified
Alonso et al. [17], 2010	7 days Amoxicillin 1 g TDS OR *Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	Not specified
Martín Gil et al. [14], 2009	7 days Amoxicillin 1 g TDS OR *Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	None
Paláez et al. [15], 2006	7–10 days Ciprofloxacin 500 mg BD + Flagyl 500 mg TDS	None

Abx = Antibiotics; PO = oral; OD = once daily; BD = twice daily; TDS = thrice daily; QDS = four times daily.
* Penicillin allergy.

Of the 533 patients with UD who were managed in ambulatory care setting, medical therapy failed in 33 patients (6.2%) across the 10 studies. In the 7 studies that had a comparative in-patient cohort, 23/351 (6.5%) and 11/239 (4.6%) patients failed medical treatment in the ambulatory and in-patient setting, respectively [1, 12, 13, 17–20]. These patients resolved with IV antibiotics and did not require any further surgical interventions in both groups.

Table 4. Outcomes of failure of medical treatment and recurrence rate at follow-up in treatment of UD

Study ID	Failure rate of medical treatment		Recurrence rate at follow-up	
	OP	IP	OP	IP
Biondo et al. [1], 2014*	3/66	4/66	–	–
Lorente et al. [19], 2013*	5/90	2/46	16/90	10/46
Rodríguez-Cerrillo et al. [12], 2013	0/34	0/18	–	–
Rueda et al. [13], 2012	8/38	5/18	–	–
Moya et al. [20], 2012	2/32	0/44	3/32	2/44
Lutwak and Dill [18], 2012	3/21	0/21	–	–
Alonso et al. [17], 2010	2/70	0/26	6/70	2/26
TCN, n (%)	23/351 (6.5)	11/239 (4.6)	25/192 (13.0)	14/116 (12.1)
Mora Lopez et al. [16], 2013*	4/68	–	–	–
Martín Gil et al. [14], 2009*	4/74	–	–	–
Paláez et al. [15], 2006*	2/40	–	–	–
Overall total, n (%)	33/533 (6.2)	11/239 (4.6)	25/192 (13.0)	14/116 (12.1)

OP = Out-patient; IP = in-patient; TCN = total comparative numbers.
* Last 3 studies with asterisks not included in comparison with in-patient cohort but numbers included in overall total.

Secondary Outcomes

Recurrence Rates at Follow-Up

Only 6 studies carried out follow-up in their patients and the different length of follow-up is shown in table 5. Only 3 of the 6 studies reported the recurrence of symptoms at this follow-up period. None of these specified whether recurrent diverticulitis was confirmed based on clinical presentation alone or with the addition of radiological confirmation using CT imaging [17, 19, 20].

Out of the 192 patients, 25 (13.0%) patients in the ambulatory setting were noted to have recurrence of symptoms at follow-up compared to 14 out of 116 (12.1%) in the in-patient setting. Regardless of treatment group for the index episode of diverticulitis, recurrent disease led to admittance to hospital, but no patient in the included studies required surgical intervention on subsequent admissions.

Table 5. Length of follow-up conducted in included studies

Study ID	Length of follow-up, months
Biondo et al. [1], 2014	2
Lorente et al. [19], 2013	1–3
Rodríguez-Cerrillo et al. [12], 2013	Nil follow-up
Rueda et al. [13], 2012	Nil follow-up
Moya et al. [20], 2012	9±18 (IP), 7±9 (OP)
Lutwak and Dill [18], 2012	Nil follow-up
Alonso et al. [17], 2010	9±23
Mora Lopez et al. [16], 2013	Nil follow-up
Martín Gil et al. [14], 2009	1
Peláez et al. [15], 2006	18±6

IP = In-patient; OP = out-patient.

Medical Cost Savings

Five studies addressed the cost benefits of ambulatory management of UD [1, 12, 14, 19, 20]. Three studies calculated the costs between ambulatory and in-patient therapy separately [1, 19, 20]. The costs incurred included ward accommodation, pharmaceutical treatment, laboratory tests and radiological investigations. Lorente et al. [19] and Moya et al. [20] specify the breakdown of these costs for each patient setting. The monetary value of savings is not given in one study, but it does report that hospital spending was reduced by 40% due to ambulatory treatment [14]. Rodríguez-Cerrillo et al. [12] reported that ambulatory treatment saves 1,368.3 euros per patient per day in comparison to in-patient treatment.

The estimated daily cost of ambulatory treatment per patient ranges from 347.21 to 1,344 euros per patient. Similarly, the cost of in-patient treatment per patient ranges from 1,038 to 3,212 euros per patient. Hence, the medical cost savings in ambulatory treatment ranged from 690 to 1,868 euros per patient.

Discussion

This systematic review evaluated the evidence relating to outcomes of ambulatory treatment in patients with UD. The evidence suggests that ambulatory treatment is a safe and viable option in selected patients with UD despite the heterogeneity in outcomes reported in the included studies.

There is currently no systematic review that focuses on any treatment of UD outside the standard hospital setting. A previous systematic review assessed the outcomes of the management of acute UD in both ambulatory and in-patient setting [23]. Jackson and Hammond [23] included studies that showed similar favourable outcomes to IV antibiotic therapy when patients with UD were treated with oral antibiotics in an in-patient setting and concluded that these results justify ambulatory treatment of UD. This review also had wider inclusion criteria, as studies included used other imaging modalities than CT imaging to diagnose patients with UD. However, only studies that selected patients below the age of 80 were included.

This is the first study of its kind to amalgamate existing evidence in the management of UD in the community, both at home and in-hospital at-home setting. In this systematic review, outcomes included used a variety of events including the failure of medical treatment, readmission rates at follow-up and medical cost savings. The strengths in this review include the use of an established search model, that a number of studies could be identified all with focus on the safety and efficacy of ambulatory treatment of UD. Exclusion criteria were used to reach the included articles, resulting in a systematic review. Statistical analysis using the chi-square model was performed to assess the significance of outcomes associated with ambulatory treatment of UD in studies that had an in-patient cohort.

There are several limitations to this review. The retrospective nature of the included studies in this review is a limiting factor and the lack of a control in-patient group in 3 of the 10 studies. Only the single RCT identified in this systematic review used the same patient inclusion criteria for ambulatory and in-patient care. Most of the controlled studies were non-randomized, and there may have been selection bias in determining which patients could be managed in the ambulatory out-patient setting, as patients enrolled into in-patient care were based on the inability to tolerate oral intake, existence of co-morbidities or a lack of social network for home support.

There was significant variability in methodology and outcome reporting between studies, limiting exact comparisons of outcomes to be made between ambulatory and in-patient treatment of UD. This also included the variation in the different time scales used by studies for immediate and long-term follow-up to report the failure rate of medical therapy and recurrence rate respectively. Similarly, not all patients who were treated in an ambulatory setting received oral antibiotics, as 2 studies included used IV antibiotics as part of hospital-at-home setting [12, 13].

Another selection bias present in this systematic review relates to the setting of included studies. A majority of current literature reported on the management of UD based in surgical settings, except that many cases of UD are usually managed in the primary care setting. Patients commonly seen in general practice are diagnosed with UD based on their clinical presentation and history without the use of diagnostic tools such as CT and managed conservatively [9]. There is currently no exact numbers on the proportions of patients with UD that are managed in a primary care setting without referral to hospitals.

A further weakness in this review was the different antibiotic regimens used, adding to the clinical heterogeneity between studies. Health economics methodology was not used in any of the 5 studies that reported health care costs as a secondary outcome. The sample size in these studies was small and thus suggests that rare and costly complications do not occur, which is a problem when health economics is considered [24]. The actual size of the difference in cost is applicable only locally and no sensitivity test to assess robustness was made. The cost differences between the 2 patient settings did not take into consideration additional costs incurred secondary to failure of medical therapy and recurrence of diverticulitis. However, all studies found that the in-patient care for UD is costlier than ambulatory care.

Despite a careful selection process in place, the elderly patients are usually not considered for ambulatory treatment due to their age and presumed frailty despite having no radiological or clinical features of concern. Two studies included in this systematic review have shown that the 'hospital-at-home' setting where patients were discharged home to receive daily IV antibiotics, monitored by daily nurse's visits and with regular doctor's appointment for follow-up was an effective alternative in the management of UD in elderly patients with co-morbidities [12, 13].

The overall failure rate of medical treatment in the ambulatory setting was 6.2% (33/533). In studies where there was an in-patient comparison group, ambulatory setting was related to a higher failure rate of medical treatment

at immediate follow-up in comparison to in-patient setting (6.5 vs. 4.6%). However, all patients who failed after the initial medical treatment were managed successfully without surgical interventions. Similar recurrence rates at longer period of follow-up were noted between both ambulatory and in-patient setting (13.0 vs. 12.1%). Ambulatory treatment of diverticulitis is associated with an estimated daily medical cost savings of between 690 and 1,868 euros per patient treated.

The findings from the studies selected are not reliable enough to make solid recommendations to the management in acute UD. Despite the lack of strong evidence, ambulatory treatment is still a safe option in selected patients in treatment of acute UD, particularly in patients with no co-morbidities and with the appropriate stage of diverticular disease as confirmed by radiology. In our systematic review, all patients had their diagnosis of UD confirmed with CT imaging that was performed within 24 h of admission. This allowed for prompt discharge of patients to continue their treatment at home. Patients in the ambulatory setting who failed medical treatment or had recurrence of symptoms were managed conservatively with antibiotics without any adverse outcomes that required surgical intervention. Such a careful selection process of patients justifies the ambulatory treatment of UD despite lack of robust evidence.

One recently published prospective study went further by a step and treated UD without antibiotics [21], based on the results of a randomized CT comparing antibiotics with no antibiotics in its population cohort [9]. It is of interest to note that the results without antibiotics seemed comparable to the other studies testing various types of antibiotics in an out-patient setting. However, even to this date, treatment with antibiotics is the preferred treatment choice to be considered in an ambulatory setting. Two recent studies reported that treatment of UD without antibiotics in ambulatory care have success rates similar to IV or oral antibiotics in a hospital setting [21, 25]. However, this review confirms the need for more RCTs, given the selection bias and heterogeneity of existing studies evaluating ambulatory and in-patient therapy in UD, before considering a change of practice away from antibiotic use in this setting.

Summary and Conclusion

This systematic review has analysed the available evidence regarding outcomes of the management of UD in an ambulatory setting. The findings are based on studies that are of poor quality and reported outcomes to a varying extent and hence, direct comparison between ambulatory and in-patient management of UD is difficult. Early radiological imaging is useful to confirm diagnosis of UD and to identify patients for whom ambulatory management of UD is a feasible option. Failure rates of medical therapy were similar, as were recurrence rates when comparing outcomes between ambulatory and in-patient care.

Considerable benefits in resource consumption are seen with ambulatory management of UD. The available evidence is limited but suggests that ambulatory care may be a safe option in the management of UD in a selected group of patients regardless of age and has the potential for significant long-term cost savings. Further RCTs are required in order to make robust recommendations regarding ambulatory management of UD.

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